National Aeronautics
and Space Administration

Autonomy and Airspace Operations

Parimal Kopardekar, PhD, Director, NASA Aeronautics Research Institute (NARI)

Parimal.H.Kopardekar@nasa.gov, Nari.arc.nasa.gov

Vertical Flight Society, Mesa, Arizona – January 24, 2023

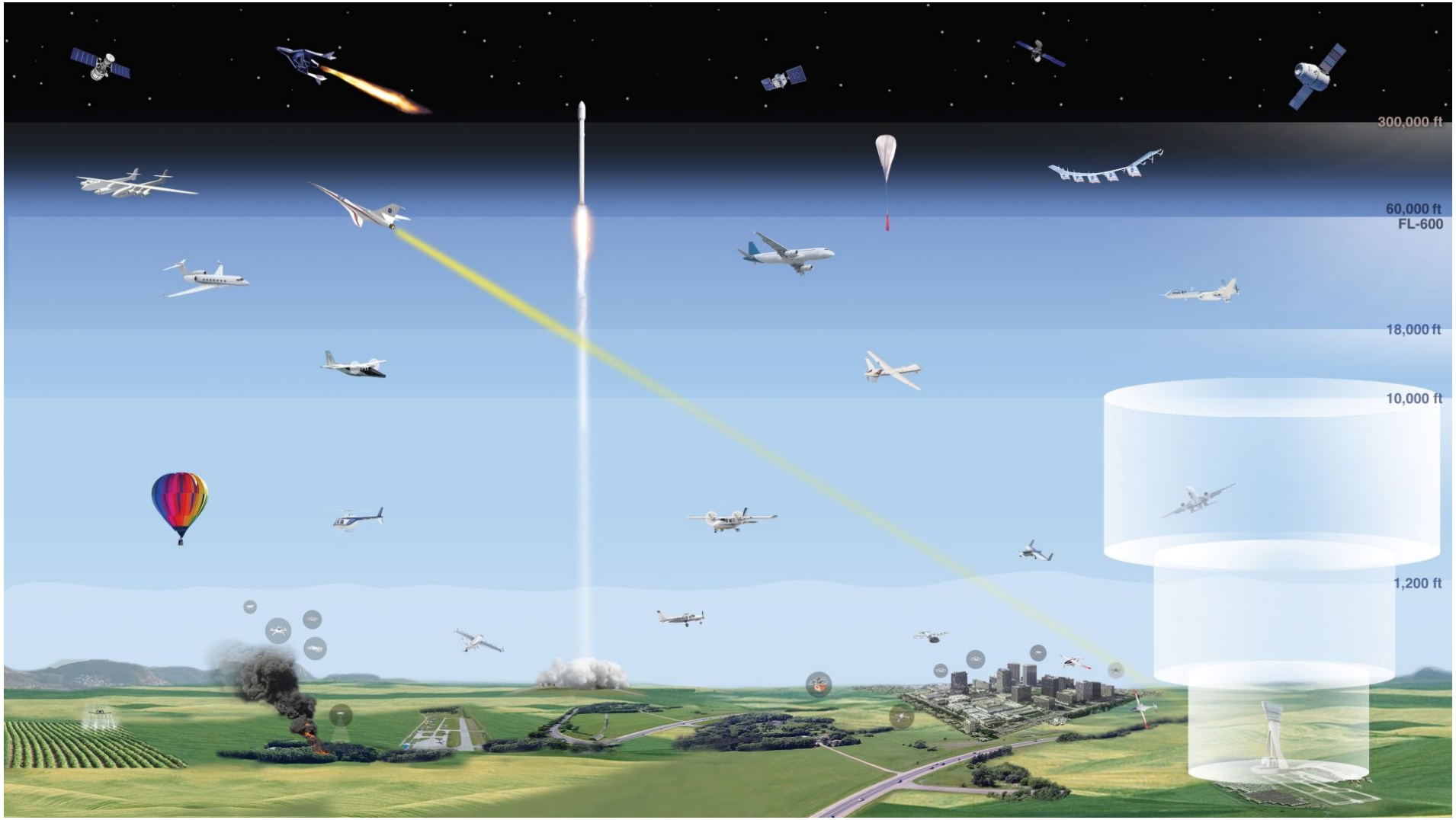
Overview

- NASA Aeronautics Priorities
- Future Airspace Operations
- Challenges
- Opportunities and Progression

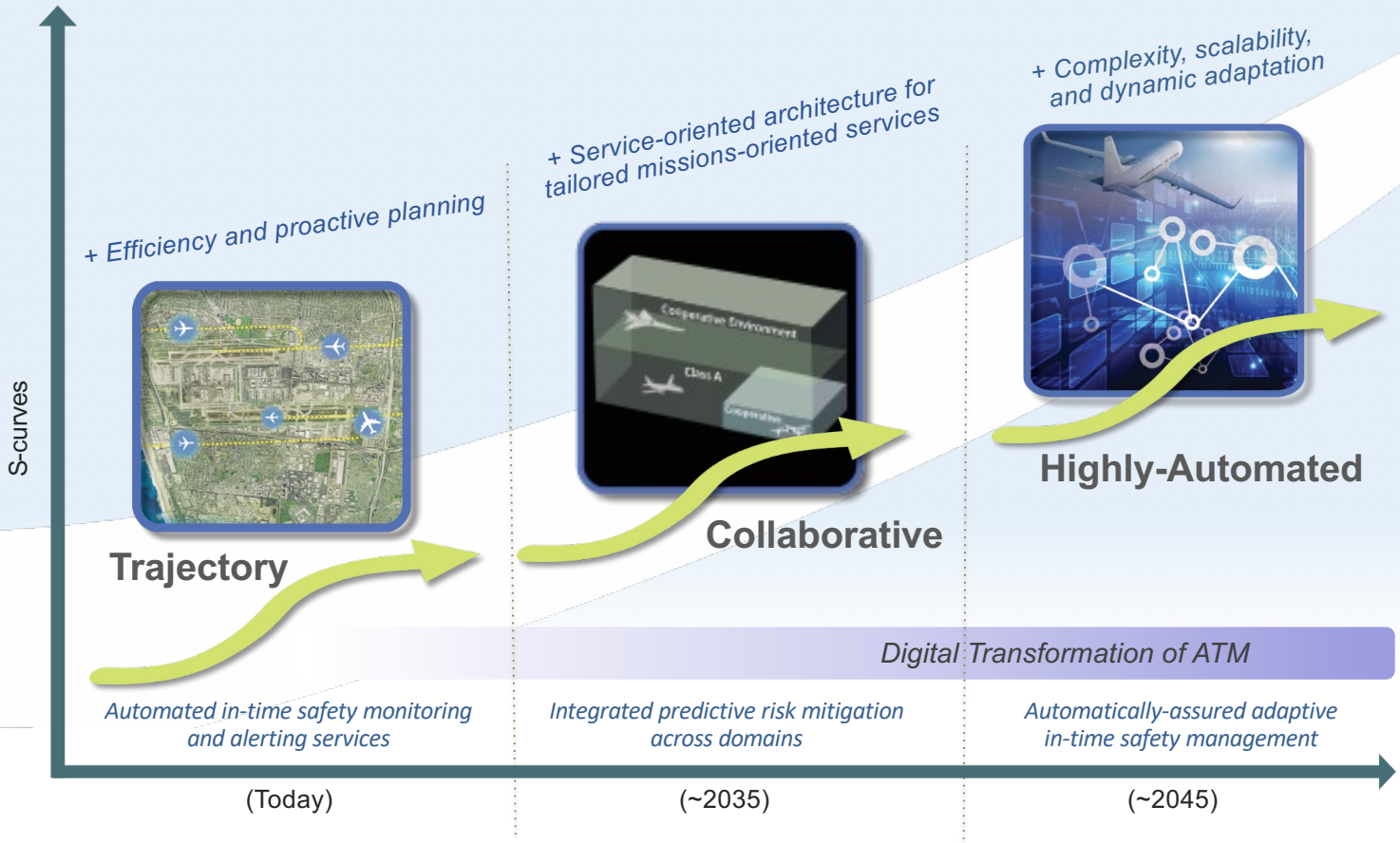
Four Transformations for Sustainability, Greater Mobility, and Economic Growth

Overview

- NASA Aeronautics Priorities
- Future Airspace Operations
- Challenges
- Opportunities and Progression


300,000 ft
60,000 ft
FL-600
18,000 ft
10,000 ft
1,200 ft

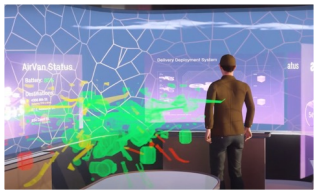
Evolution of Airspace Operations and Safety



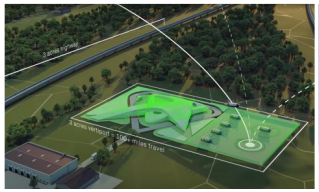
Planning to Achieve a Sky for All

Imagining tomorrow's aviation system today, leveraging FAA Info-centric NAS

Operator Optimization



Ubiquitous and Resilient Operations



Sustainable Solutions

Seamless Skies

Learning-Based Systems and Communities

- NASA-led effort to gather inputs from the aerospace community and FAA
- Co-developed vision of a mid-21st century shared airspace that is agile, scalable, optimizable, increasingly diverse, and equitable
- Evolution from trajectory-based operations to collaborative and highly automated operations
- Sky for All results will inform ARMD research and development portfolio and collaboration with FAA

SKY for ALL

A thriving airspace must be scalable, accessible, safe, sustainable, and resilient.

Overview

- NASA Aeronautics Priorities
- Future Airspace Operations
- Challenges
- Opportunities and Progression

Autonomy is a Complex Issue

- Technology readiness
- Safety
- Human-autonomy teaming
- Certification
- Acceptance

Vertical Flight Society Special Edition

AUTONOMY

FOR

DUMMIES

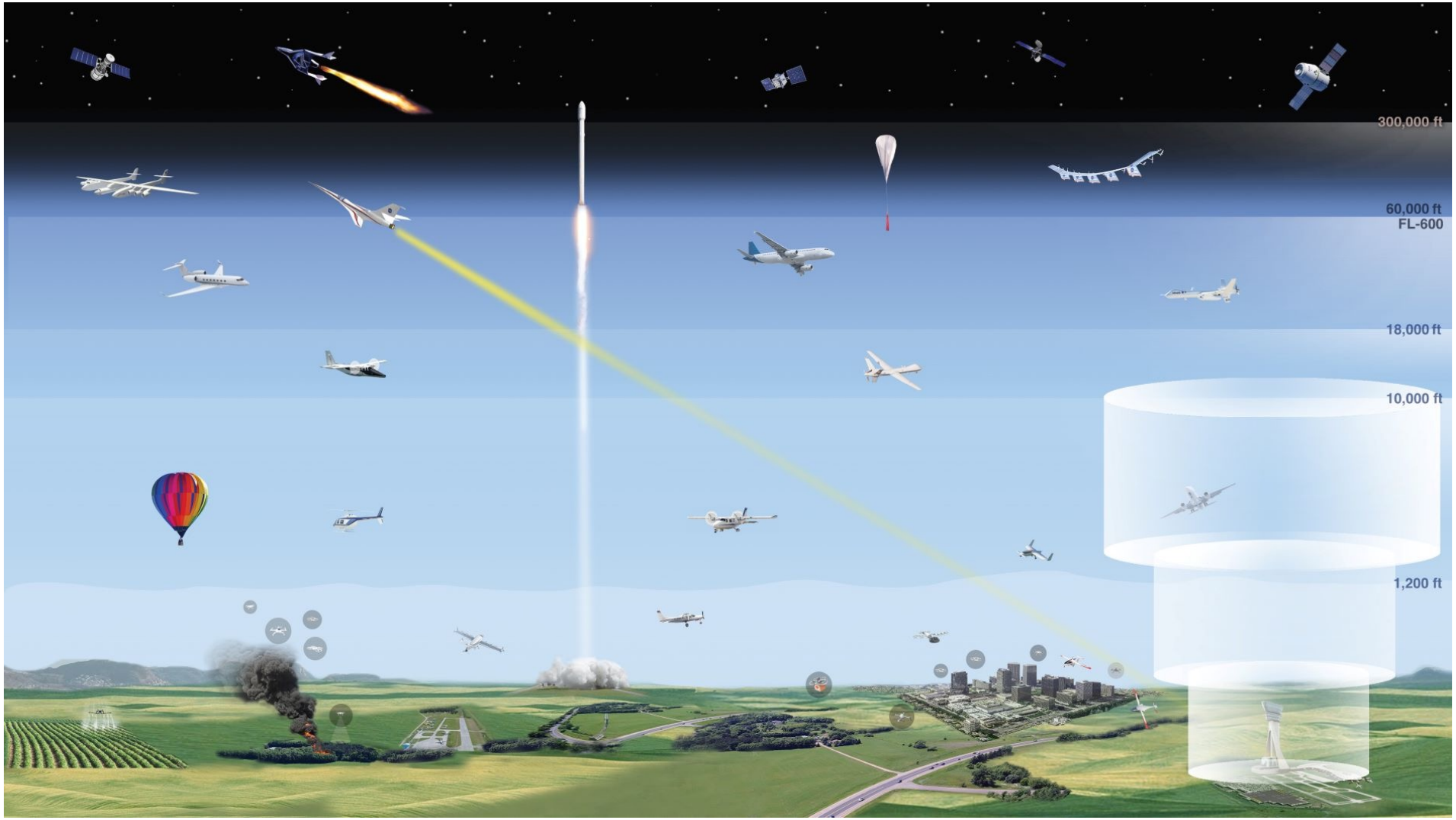
By

Mike Hirschberg

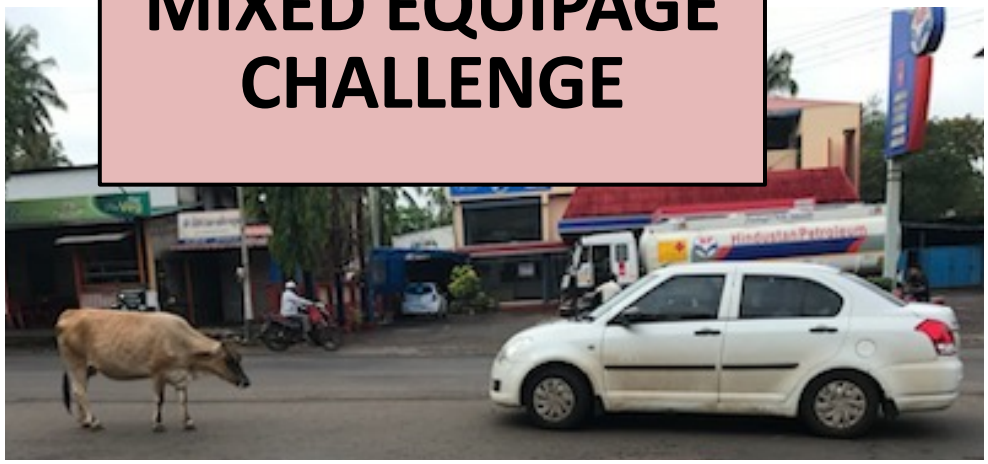
PRIOR WORK

https://ntrs.nasa.gov

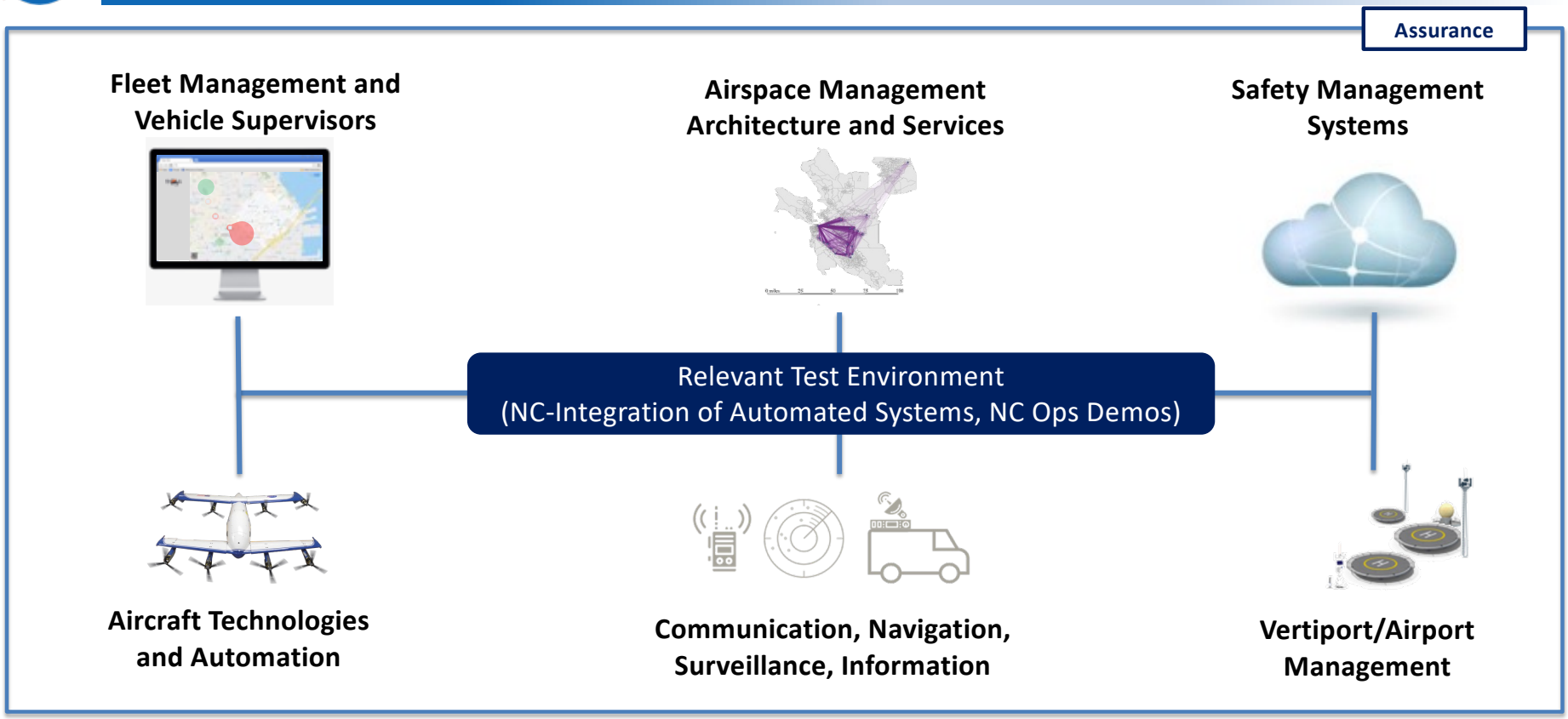
NASA Technical Reports Server


300,000 ft
60,000 ft
FL-600
18,000 ft
10,000 ft
1,200 ft

MIXED EQUIPAGE CHALLENGE



Moving Towards an Increasingly Automated Future



NASA's role emphasizes an enterprise approach towards assessing automated architectures and recommending requirements

Overview

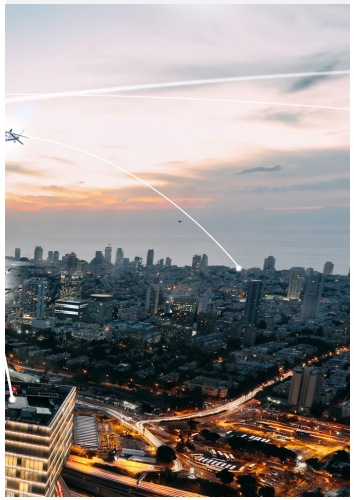
- NASA Aeronautics Priorities
- Future Airspace Operations
- Challenges
- Opportunities and Progression

NASA Role to Address Advanced Air Mobility Challenges

Vehicle Development and Operations

Airspace Design and Operations

Community Integration



NASA and key partners are collectively taking on the most difficult mission challenges to enable industry to flourish

- **Research and Development Portfolio**
- **Robust Ecosystem Partnerships**
- **AAM National Campaign Series**

NASA will deliver long-term solutions through concepts, requirements and technologies for industry and the FAA

Advanced Capabilities for Emergency Response Operations

Transformation – Initial Minimum Viable Products & Operations Examples
Lowest risk: Autonomous Cargo Operations Among Hawaii Islands

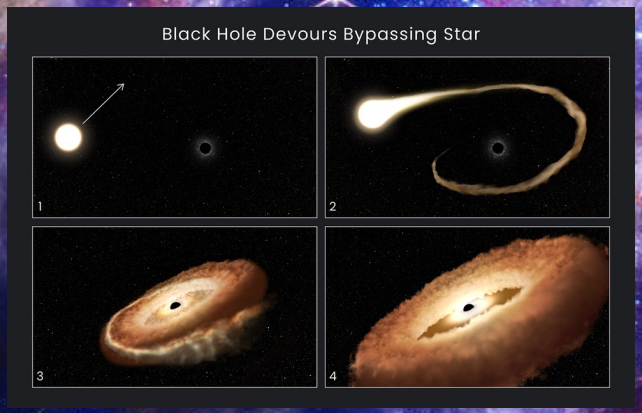
Example: Moffett Field to Hayward Executive Terminal

To invent an airplane is nothing. To build one is something. But to fly is everything - Otto Lilienthal

Scaled operations in mixed equipage environment and ensure interoperability in airspace is very complex!

NASA is hiring – usajobs.gov

Innovation in Aviation While Respecting its Safety Tradition!



Parimal.H.Kopardekar@nasa.gov